DISPLAY DEVICE

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention relates to a liquid crystal display device, and more particularly to a liquid crystal display device which is referred to as a partial transmissive type.

2. DESCRIPTION OF THE RELATED ART

The liquid crystal display device which is referred to as the partial transmissive type is used as a miniaturized liquid crystal display device for a mobile telephone or the like. This liquid crystal display device can make a user recognize images on a display screen using light made of a reflective light of sun (a light reflection mode) or using light of a backlight incorporated in the liquid crystal display device (a light transmissive mode) depending on the situation where the liquid crystal display device is used.

That is, out of respective transparent substrates which are arranged to face each other in an opposed manner with liquid crystal therebetween, on a liquid-crystal-side surface of one transparent substrate, regions which are surrounded by gate signal lines which extend in the x direction and are juxtaposed in the y direction and drain signal lines which extend in the y direction and are juxtaposed in the x direction constitute

pixel regions. In each pixel region, a switching element which is driven by supplying a scanning signal from one gate signal line and a pixel electrode to which a video signal is supplied from one drain signal line through the switching element are formed.

The pixel electrode is formed of a light transmissive conductive layer made of ITO (Indium-Tin-Oxide), for example, in one region defined in the pixel region and is formed of a non-light transmissive conductive layer such as a metal layer made of Al or the like in the other region defined in the pixel region.

Here, the pixel electrode generates an electric field between the pixel electrode and a counter electrode which is formed in common with respect to respective pixel regions and is formed of a light transmissive conductive layer on a liquid-crystal-side surface of the other transparent substrate, and liquid crystal within the pixel region is activated in response to the electric field.

In this case, a portion in which the light transmissive pixel electrode is formed is used as a light transmissive region and a portion in which the non-light transmissive pixel electrode is formed is used as a light reflective region.

Further, in such a constitution, it has been known a technique that the pixel electrode formed of the light transmissive conductive layer is arranged below an insulation

film, a hole is formed in an insulation film in a region corresponding to the light transmissive region so as to expose the pixel electrode formed of the light transmissive conductive layer, and the pixel electrode formed of the non-light transmissive conductive film is formed in a region above the insulation film and excluding the light transmissive region, that is, the light reflective region.

Here, the reason that the hole is formed in the region corresponding to the light transmissive region of the insulation film is to make a length of an optical path of light which passes the inside of liquid crystal in the light transmissive region substantially equal to a length of an optical path of light which passes the inside of liquid crystal in the light transmissive region.

SUMMARY OF THE INVENTION

However, with respect to the liquid crystal display device having such a constitution, it has been found that a frame-like luminance difference is generated in a periphery of the hole formed in the insulation film (light transmissive region) at the time of displaying.

As a result of the extensive study of causes of such a phenomenon, it has been found out that since a steep stepped portion is formed at a portion corresponding to a side wall surface of the hole formed in the insulation film, the disturbance of

the orientation of the liquid crystal is liable to be easily generated whereby, at the time of performing a black display in the light transmissive mode, for example, the complete black display cannot be obtained in such a portion thus giving rise to the above-mentioned drawback.

The present invention has been made in view of such circumstances and it is an object of the present invention to provide a liquid crystal display device which can prevent the generation of the frame-like luminance difference in a portion which surrounds a light transmissive region.

To briefly explain the summary of typical inventions among inventions disclosed in this specification, they are as follows.
Means 1.

In a liquid crystal display device according to the present invention, for example, in a pixel region formed on a substrate, a first pixel electrode formed of a light transmissive conductive layer is formed in one optical transmissive region which is formed by partitioning the pixel region and a second pixel electrode formed of a non-light transmissive conductive film is formed on the other light reflective region.

The first pixel electrode is positioned as a lower layer with respect to an insulation film and, at the same time, a hole is formed in the insulation film in a region corresponding to the light transmissive region so as to expose the first pixel electrode, and the second pixel electrode is formed on a light

reflective region of the insulation film, and

at least a portion corresponding to a side wall surface of the hole formed in the insulation film is shielded from light.

Means 2.

The liquid crystal display device according to the present invention is, for example, on the premise of the constitution of means 1, characterized in that on one of a pair of substrates which are arranged to face each other in an opposed manner with liquid crystal therebetween, the first pixel electrode and the second pixel electrode are formed and, at the same time, a light shielding film which is positioned below the insulation film is provided to at least the portion corresponding to the side wall surface of the hole formed in the insulation film.

Means 3.

The liquid crystal display device according to the present invention is, for example, on the premise of the constitution of means 1, characterized in that on one of a pair of substrates which are arranged to face each other in an opposed manner with liquid crystal therebetween, the first pixel electrode and the second pixel electrode are formed and, at the same time, a light shielding film is provided to a portion corresponding to a side wall surface of a hole formed in the insulation film of the other substrate of the respective substrates.

Means 4.

The liquid crystal display device according to the present

invention is, for example, characterized in that on one of respective substrates which are arranged to face each other with liquid crystal therebetween, a plurality of juxtaposed gate signal lines and a plurality of juxtaposed drain signal lines which cross the respective gate signal lines are formed,

regions surrounded by these respective signal lines constitute pixel regions, and each pixel region includes a switching element which is operated in response to a scanning signal from the gate signal line and a pixel electrode to which a video signal is supplied from the drain signal line through the switching element,

the pixel electrode is constituted of a first pixel electrode formed of a light transmissive conductive layer formed in a light transmissive region which constitutes one region after partitioning the pixel region and a second pixel electrode formed of a non-light transmissive conductive film which is formed of a light reflective region which constitutes the other region after partitioning the pixel region,

the first pixel electrode is positioned as a lower layer with respect to an insulation film, a hole is formed in the insulation film in a region corresponding to the light transmissive region so as to expose the first pixel electrode, the second pixel electrode is formed in the light reflective region of the insulation film, and

a light shielding film which is positioned as a layer below

the insulation film is provided to at least a portion corresponding to a side wall surface of the hole formed in the insulation film.

Means 5.

The liquid crystal display device according to the present invention is, for example, on the premise of the constitution of means 4, characterized in that the light shielding film is made of a material equal to a material of the gate signal lines.

Means 6.

The liquid crystal display device according to the present invention is, for example, characterized in that on one of respective substrates which are arranged to face each other with liquid crystal therebetween, a plurality of juxtaposed gate signal lines and a plurality of juxtaposed drain signal lines which cross the respective gate signal lines are formed,

regions surrounded by these respective signal lines constitute pixel regions, and each pixel region includes a switching element which is operated in response to a scanning signal from the gate signal line and a pixel electrode to which a video signal is supplied from the drain signal line through the switching element,

the pixel electrode is constituted of a first pixel electrode formed of a non-light transmissive conductive layer which is formed in a light reflective region formed surrounding a light transmissive region and a second pixel electrode formed

of a light transmissive conductive layer which is formed on the light reflective region,

the second pixel electrode is positioned as a lower layer with respect to an insulation film, a hole is formed in the insulation film in a region corresponding to the light transmissive region so as to expose the second pixel electrode, the first pixel electrode is formed in the light reflective region of the insulation film,

a light shielding film which is positioned as a layer below the insulation film is provided to at least a portion corresponding to a side wall surface of the hole formed in the insulation film and,

the light shielding film is formed as a layer below the second pixel electrode and, at the same time, there exists a portion where the light shielding layer is not formed at a part of the portion corresponding to the side wall surface of the hole formed in the insulation film.

Means 7.

The liquid crystal display device according to the present invention is, for example, characterized in that on one of respective substrates which are arranged to face each other with liquid crystal therebetween, a plurality of juxtaposed gate signal lines and a plurality of juxtaposed drain signal lines which cross the respective gate signal lines are formed,

regions surrounded by these respective signal lines

constitute pixel regions, and each pixel region includes a switching element which is operated in response to a scanning signal from the gate signal line and a pixel electrode to which a video signal is supplied from the drain signal line through the switching element,

the pixel electrode is constituted of a first pixel electrode formed of a non-light transmissive conductive layer which is formed in a light reflective region formed surrounding a light transmissive region and a second pixel electrode formed of a light transmissive conductive layer which is formed on the light reflective region,

the second pixel electrode is positioned as a lower layer with respect to an insulation film, a hole is formed in the insulation film in a region corresponding to the light transmissive region so as to expose the second pixel electrode, the first pixel electrode is formed in the light reflective region of the insulation film,

a light shielding film which is positioned as a layer below the insulation film is provided to at least a portion corresponding to a side wall surface of the hole formed in the insulation film and,

the light shielding film is made of a material equal to a material of the gate signal lines and is formed as a layer below the second pixel electrode and, at the same time, there exists a portion where the light shielding layer is not formed

at a part of the portion corresponding to the side wall surface of the hole formed in the insulation film and the portion includes a portion which is close to the switching element.

It is needless to say that the present invention is not limited to the above-mentioned constitution and various modifications can be made without departing from the technical concept of the present invention.

Brief Description of the Several Views of the Drawings

Fig. 1 is a plan view showing one embodiment of a pixel of a liquid crystal display device according to the present invention.

Fig. 2 is a cross-sectional view taken along a line II-II in Fig. 1.

Fig. 3 is a cross-sectional view for explaining an advantageous effect of the present invention.

Fig. 4 is a plan view showing another embodiment of the pixel of the liquid crystal display device according to the present invention.

Fig. 5 is a plan view showing another embodiment of the pixel of the liquid crystal display device according to the present invention.

Fig. 6 is a cross-sectional view showing another embodiment of the pixel of the liquid crystal display device according to

the present invention.

Detailed Description of the Invention

Hereinafter, embodiments of the liquid crystal display device according to the present invention are explained in conjunction with the drawings.

Embodiment 1.

Fig. 1 is a plan view showing one embodiment of the constitution of a pixel of a liquid crystal display device according to the present invention. Further, Fig. 2 is a cross-sectional view taken along a line II-II in Fig. 1.

Pixels in these drawings are formed within regions which are surrounded by gate signal lines GL which extend in the x direction and are juxtaposed in the y direction in the drawing and the drain signal lines DL which extend in the y direction and are juxtaposed in the x direction (pixel regions) in the drawing.

First, the above-mentioned gate signal lines GL are formed on the liquid-crystal-side surface of the transparent substrate SUB1. The gate signal line GL has a portion which is extended slightly to the pixel region side and this extended portion forms a gate electrode GT of a thin film transistor TFT which will be explained later. This gate signal line GL and the gate electrode GT are made of, for example, aluminum (Al) or an alloy thereof and a anodized film formed by anodizing the surface of

the aluminum or alloy.

Further, a capacitive signal line CL extending in the x direction in the drawing is formed in the pixel region and this capacitive signal line CL is arranged in the vicinity of the gate signal line GL which is positioned, for example, in the upper portion of the drawing. This capacitive signal line CL has a portion which extends comparatively largely to the center side of the pixel region and the extended portion forms an electrode CT1 which constitutes one of the capacitive elements Cstg which will be explained later. This capacitive signal line CL and the electrode CT1 are formed, for example, in the same step as the above-mentioned gate signal line GL and the materials thereof are also made of aluminum (Al) or an alloy thereof and an anodized film formed by anodizing a surface of the material.

Further, although the pixel according to this embodiment is configured such that, for example, a light transmissive region LTA is formed in an approximate center of the region and a light reflective region LRA is formed surrounding the light transmissive region LTA, in this embodiment, a light shielding layer LIL having a given width is formed at a portion corresponding to a boundary portion between the light transmissive region LTA and the light reflective region LRA. This light shielding layer LIL is formed in the same step as the above-mentioned gate signal line GL , for example, and the material of the light shielding layer LIL is aluminum (Al) or an alloy thereof, wherein no anodized

film is formed on a surface of light shielding layer LIL. This is because that the light shielding layer LIL is formed in an island shape independently in the pixel region and hence, it is difficult to anodize the light shielding layer LIL. However, it is not a drawback for the light shielding layer LIL that no anodized film is formed on the surface of the light shielding layer LIL. The functions of the light shielding layer will be explained in detail later.

A light transmissive conductive layer made of, for example, ITO (Indium Tin Oxide), ITZO (Indium Tin Zinc Oxide), IZO (Indium Zinc Oxide), SnO_2 (Tin Oxide), In_2O_3 (Indium Oxide) or the like is formed in an approximately half of the pixel region at the thin film transistor TFT side. As will be clearly understood from the explanation which will be made later, the light transmissive conductive layer is formed such that the light transmissive conductive layer covers the light transmissive region LTA enough for playing a role of a pixel electrode PX (T) in the light transmissive region LTA.

Further, for example, simultaneously with the formation of the light transmissive conductive layer, the light transmissive conductive layer is also formed on an upper surface of an electrode CT1 of the capacitive element Cstg and this light transmissive conductive layer constitutes another electrode CT2 of the capacitive element Cstg. In this case, between these electrode CT1 and CT2, an anodized film on a surface of the

electrode CT1 is interposed and the anodized film constitutes one of dielectric films of the capacitive element Cstg.

Further, a sequential laminated body formed of a gate insulation film GI and a semiconductor layer AS which is made of amorphous Si is formed such that the sequential laminated body strides over the gate electrode GT. The gate electrode GT, the gate insulation film GI and the semiconductor layer AS are members which constitute a thin film transistor TFT. That is, by forming a drain electrode and a source electrode on the semiconductor layer AS, a MIS (Metal Insulator Semiconductor) transistor having a so-called inversely staggered structure is formed.

Further, the sequential laminated body formed of the gate insulation film GI and the semiconductor layer AS extends over the whole area of the region in which the drain signal line DL which will be mentioned later is formed. Accordingly, in the formation of the drain signal line DL, the drain signal line DL is formed on a portion having no stepped portion. This can prevent the occurrence of a broken step in the drain signal line DL which may be caused by the stepped portion.

Further, in a portion where a conductive state is established between the light transmissive conductive layer constituting the pixel electrode PX(T) in the light transmissive region LTA and the light transmissive conductive layer constituting the electrode CT2 of the capacitive element Cstg,

a sequential laminated body formed of a gate insulation film GI′ and a semiconductor layer AS′ is formed and the above-mentioned conductive state is established through a hole formed in the sequential laminated body. In this case, the conductive state is, for example, established by a conductive layer SD which is made of a material equal to a material of the drain signal line DL at the time of forming the drain signal line DL which will be formed by a following step, for example. The reason that the conductive state is established between the light transmissive conductive layer constituting the pixel electrode PX (T) and the light transmissive conductive layer constituting the electrode CT1 of the capacitive element Cstg using such a comparatively complicated constitution is to relax the stress generated due to the relationship with materials constituting the electrode CT1 of the capacitive element Cstg or the like.

Here, the gate insulation film GI′ and the semiconductor layer AS′ are formed simultaneously with the formation of the gate insulation film GI and the semiconductor layer AS in the region where the thin film transistor TFT is formed, for example.

Then, the drain signal lines DL which extend in the y direction and are juxtaposed in the x direction in the drawing are formed. As mentioned above, these drain signal lines DL are formed on the sequential laminated bodies of the gate insulation films GI and the semiconductor layers AS and hence,

the drain signal lines DL can be formed obviating the possibility of occurrence of broken steps at stepped portions because of the flatness of the sequential laminated bodies.

Further, an extended portion which extends to a position above the semiconductor layer AS is formed at a portion of the drain signal line DL and this extended portion is configured to form the drain electrodes SD1 of the thin film transistor TFT.

Further, along with the formation of the drain signal line DL, the source electrode SD2 is formed in a spaced-apart manner from the drain electrode SD1 by a length corresponding to a channel length of the thin film transistor TFT. The source electrode SD2 has an extended portion which extends to a position above the pixel electrode PX (T). This extended portion is also served for the connection with the pixel electrode PX (R) as will be explained later.

Further, as described previously, during the formation of the drain signal lines DL, the conductive layer SD for establishing the conductive state between the light transmissive conductive layer constituting the pixel electrode PX (T) in the light transmissive region LTA and the light transmissive conductive layer constituting the electrode CT2 of the capacitive element Cstg is formed.

Then, on a surface of the transparent substrate SUB1 having such a constitution, an inorganic protective film PAS1 which

constitutes one of the protective films PAS is formed using a silicon nitride film or the like, for example. In this inorganic protective film PAS1, in the vicinity of the thin film transistor TFT, a hole CH1 which is served for ensuring a contact with the pixel electrode PX (R) which will be explained later and an opening portion HL1 which is served for exposing the light transmissive region LTA are formed.

Further, on a surface of the inorganic protective film PAS1, an organic protective film PAS2 is formed using a material such as resin or the like, for example. The above-mentioned inorganic protective film PAS1 and this organic protective film PAS2 collectively constitute a protective film PAS for mainly obviating a direct contact between the thin film transistor TFT and the liquid crystal. This provision is provided for decreasing the dielectric constant of the protective film PAS as a whole.

In the organic protective film PAS2, at a portion thereof where the hole CH1 is formed in the inorganic protective film PAS1, a hole CH2 which is smaller than the hole CH1 and shares the same central axis with the hole CH1 is formed. Further, in the organic protective film PAS2, at a portion where the opening portion HL1 is formed in the inorganic protective film PAS1, an opening portion HL2 which is smaller than the opening portion HL1 and shares the same central axis with opening portion HL1 is formed.

Here, the opening portion HL2 formed in the organic protective film PAS2 constitutes the light transmissive region LTA in the pixel region and the pixel electrode PX (T) which is exposed through the opening portion HL2 functions as the pixel region PX in the light transmissive region LTA.

Further, the reason why the opening portion HL2 is formed in the region corresponding to the light transmissive region LTA of the organic protective film PAS2 is to make a length of an optical path of light passing through the liquid crystal in the light transmissive region LTA and a length of an optical path of light passing through the liquid crystal in the light reflective region LRA substantially equal.

Further, on a surface of the organic protective film PAS2, that is, on the region corresponding to the light reflective region LRA, the pixel electrode PX (R) which also functions as a reflector is formed. The pixel electrode PX (R) is made of, for example, Al, an alloy thereof or a laminated body including Al or the alloy. In any case, the pixel electrode PX (R) is made of a material having a favorable reflective efficiency (reflectance), while when the pixel electrode PX (R) is formed in the laminated body, the pixel electrode PX (R) constitutes a top layer of the laminated body.

Further, the pixel electrode PX (R) is connected to the source electrode SD2 of the thin film transistor TFT through the hole CH2 formed in the protective film PAS2 and is configured

to have the equal potential as the pixel electrode PX (T) in the light transmissive region LTA.

Further, the formation of the pixel electrode PX (R) in the light transmissive region LTA, that is, in the opening portion of the protective film PAS2 is obviated. Accordingly, the pixel electrode PX (R) formed in the light reflective region LRA and the pixel electrode PX (T) formed in the light transmissive region LTA are, in a plan view, defined by a side wall surface of the opening portion of the protective film PAS2.

Still further, among peripheral sides of the pixel electrode PX (R), respective sides which are arranged parallel to the y direction in the drawing are overlapped to the drain signal lines DL and, at the same time, respective sides which are arranged parallel to the x direction in the drawing are overlapped to the capacitive signal lines CL. This is because, by forming the pixel electrode PX (R) such that the pixel electrode PX (R) slightly extends over the pixel region, the numerical aperture of the pixels can be enhanced.

Further, a parasitic capacitance between the pixel electrode PX (R) and the drain signal line DL or the capacitive signal line CL causes no significant problems because the protective film PAS1 among the protective films PAS is constituted of an organic material having a comparatively small dielectric constant.

Further, the pixel electrode PX (R) is also configured

to function as an electrode having the protective films PAS1, PAS2 as dielectric films between the pixel electrode PX (R) and the electrode CT2 in the region where the capacitive elements are formed. Accordingly, the capacitive element Cstg having a two-stage constitution is formed between the capacitive signal line CL and the pixel electrode PX (R) and hence, although the occupied region of the pixel electrode PX (R) is small, the pixel electrode PX (R) can obtain a large capacity.

Further, on a surface of the transparent substrate SUB1 having such a constitution, an orientation film is formed and this orientation film determines the initial orientation of molecules of the liquid crystal which is brought into direct contact with the liquid crystal.

In the liquid crystal display device having such a constitution, the light shielding layer ILI is formed, as shown in Fig. 1, on the boundary portion between the light transmissive region LTA and the light reflective region LRA.

The light transmissive region LTA is constituted of a portion where an opening portion is formed in the protective film PAS and the light reflective region LRA is constituted of a portion where the protective film PAS is formed. Accordingly, the boundary portion of the light transmissive region LTA and the light reflective region LRA corresponds to the side wall surface of the opening portion of the protective film PAS and hence, the orientation of the liquid crystal is not sufficiently

performed in this boundary portion. This is because it is difficult to perform the rubbing treatment of the orientation film with accuracy.

Accordingly, when the black display is performed in the light transmissive region LTA, the complete black display is not performed on the portion and a frame-like pattern is recognized by naked eyes. In view of the above, the light shielding layer ILI is formed on this portion for overcoming the above-mentioned drawback.

Fig. 3 is a view showing a cross section at the boundary portion of the light transmissive region LTA and the light reflective region LRA. An orientation film ORI1 which is arranged to be in contact with the liquid crystal cannot receive the appropriate rubbing treatment on the side wall surface of the opening portion HL2 formed in the organic protective film PAS2 and the bottom surface in the vicinity of the side wall surface. Accordingly, the liquid crystal (shown as A in the drawing) in this portion cannot exhibit the proper behavior and hence, for example, when the black display is performed in the light transmissive region LTA, the complete black display cannot be obtained on the portion.

Accordingly, the light shielding layer ILI is formed on the portion where the proper rubbing treatment cannot be performed. In the manufacturing steps of the liquid crystal display device, it is difficult to form the light shielding layer

only on the region where the appropriate rubbing treatment cannot be performed. In the cross-sectional view shown in Fig. 3, considering the displacement of the position in the manufacturing steps of the liquid crystal display device, an end portion of the opening portion HL2 of the organic protective film PAS2 is arranged on the light shielding layer ILI. The light shielding layer ILI is formed such that the light shielding layer ILI strides over the light reflective region LRA and the light transmissive region LTA and hence, it is possible to ensure the light shielding in the region where the appropriate rubbing treatment cannot be performed. Further, in the liquid crystal display device shown in Fig. 3, since the protective film PAS2 is formed over the light shielding layer ILI, the light shielding region can be narrowed. Accordingly, the luminance of a display screen in a light transmissive mode as well as in a light reflective mode can be enhanced.

Here, Fig. 3 also shows the transparent substrate SUB2 which is arranged over the transparent substrate SUB1 with the liquid crystal LC therebetween. Color filters FIL, an overcoat film OC, a counter electrode CT and an orientation film ORI2 are formed on a liquid crystal side surface of the transparent substrate SUB2.

Further, in this embodiment, the light shielding layer ILI is constituted such that the light shielding layer ILI is not formed in the vicinity of the thin film transistor TFT.

The reason why this constitution is adopted is that, first, by forming the portion where the light shielding layer ILI is not formed on the boundary portion between the light transmissive region LTA and the light reflective region LRA, the region in which the pixel electrode PX (T) formed of the light transmissive conductive layer does not stride over the light shielding layer ILI is formed. The pixel electrode PX (T) has characteristics that the pixel electrode PX (T) is easily broken at a stepped portion. This constitution can prevent the electrical disconnection between the pixel electrode PX (T) formed in the light transmissive region LTA and the source electrode SD2 of the thin film transistor TFT which is caused by the broken step.

Further, another reason that the portion where the light shielding layer ILI is not formed is arranged particularly close to the thin film transistor TFT is to make the light shielding layer ILI and the gate electrode GT of the thin film transistor TFT further spaced apart each other eventually so as to obviate the electrical connection between them.

Embodiment 2.

Fig. 4 is a plan view showing another embodiment of the pixel of the liquid crystal display device according to the present invention and corresponds to Fig. 1.

The constitution which makes this embodiment different from the embodiment shown in Fig. 1 lies in that the light shielding layer ILI is not formed not only in the vicinity of the thin

film transistor TFT within the boundary portion between the light transmissive region LTA and the light reflective region LRA, but also in other portions within such a boundary portion, for example, in the vicinity of the capacitive element Cstg.

This constitution is provided for eliminating with high probability the drawback that the pixel electrode PX (T) which is formed by striding over the light shielding layer ILI is broken at the stepped portion of the light shielding layer ILI.

Embodiment 3.

Fig. 5 is a plan view showing another embodiment of the pixel of the liquid crystal display device according to the present invention and corresponds to Fig. 1.

The constitution which makes this embodiment different from the embodiment shown in Fig. 1 lies in that the light shielding layer ILI is formed continuously along the whole area of the boundary portion between the light transmissive region LTA and the light reflective region LRA.

This embodiment is based on the understanding that If the drawback which is generated by the constitution that the pixel electrode PX (T) is formed striding over the light shielding layer ILI can be eliminated by any means, it is unnecessary for the boundary portion between the light transmissive region LTA and the light reflective region LRA to have a portion where the light shielding layer is not formed in a portion of the boundary.

Here, as the means for eliminating such a drawback, for

example, by forming the light shielding layer ILI above the pixel electrode PX (T), there is no fear that the pixel electrode PX (T) is broken at the stepped portion and hence, in this case, the light shielding layer ILI can be formed continuously along the whole boundary portion between the light transmissive region LTA and the light reflective region LRA.

Embodiment 4.

Fig. 6 is a constitutional view showing another embodiment of the pixel of the liquid crystal display device according to the present invention and corresponds to Fig. 3.

The constitution which makes this embodiment different from the embodiment shown in Fig. 3 lies in that the light shielding film ILI extends over the light reflective region LRA. In other words, the light shielding film ILI is formed such that the light shielding film ILI extends outwardly from the light transmissive region LTA.

This embodiment is made based on the understanding that the extended portion forms a portion of the light reflective region LRA and hence, the extended portion gives no influence on the display.

Embodiment 5.

Further, although the light shielding layer ILI is formed on the transparent substrate SUB1 side in the above-mentioned respective embodiments, the present invention is not limited to such a constitution. That is, it is also possible to have

the substantially same advantageous effects by forming the light shielding layer ILI on the corresponding portion of the transparent substrate SUB2 side.

Embodiment 6.

Further, in the above-mentioned respective embodiments, the light transmissive region LTA is positioned at the center of the pixel region and the light reflective region LRA is formed in the periphery of the light transmissive region LTA. However, it is needless to say that, for example, even when, using an imaginary line which extends in the x direction in the drawing as a boundary, the light reflective region LRA is formed above the boundary and the light transmissive region LTA is formed below the boundary, the present invention is applicable to the boundary portion of the light reflective region LRA and the light transmissive region LTA.

As can be clearly understood from the foregoing explanation, the liquid crystal display device according to the present invention can prevent the occurrence of the frame-like luminance difference in the portion which surrounds the light transmissive region.